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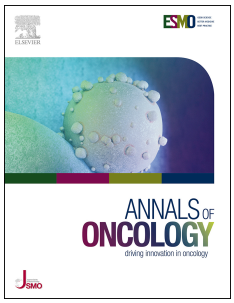

Do Patients with Cancer Have a Poorer Prognosis of COVID-19? An Experience in New York City.

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Title: Do Patients with Cancer Have a Poorer Prognosis of COVID-19? An Experience in New York City.

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The outbreak of coronavirus disease 2019 (COVID-19) emerged in late 2019 in Wuhan, China, and has been spreading rapidly. As the infection has become widespread, concern for the influence of COVID-19 on patients with cancer has grown. Zhang et al. reported a retrospective case study of 28 COVID-19-infected cancer patients with an astonishingly high mortality rate. (28.6 %) [1] However, as Oh pointed out, the result cannot be applied to other countries with different cancer epidemiology and practice. [2] We herein sought to determine if patients with cancer in the US have a poorer prognosis of COVID-19 by analyzing the electronic medical records (EMR) of Mount Sinai Health System (MSHS) in New York City.

We analyzed the EMR of MSHS from March 1 to April 6, 2020, using Epic SlicerDicer software. We extracted data (sex, age, comorbidities, intubation, and mortality status as of April 8) from patients who were positive for the COVID-19 RT PCR test during this period. MSHS waived Institutional Review Board approval since this research used only deidentified, aggregate-level data.

5,688 patients had COVID-19, and there were 334 patients (6 %) with cancer among them. (57, 56, 23, 18, and 16 patients with breast, prostate, lung. urothelial, and colon cancer, respectively) Without adjusting for age groups, patients with cancer were intubated significantly more frequently (relative risk (RR) [95 % confidence interval (CI)]; 1.89 [1.37 – 2.61]), but the rate of death was not significantly different. By stratifying patients by age groups, we detected a significantly increased risk of intubation in patients with cancer aged 66 to 80. (RR [95 % CI]; 1.76 [1.15 – 2.70]) No significant difference in intubation risk was found in other age groups. Additionally, patients with cancer younger than 50 years had a significantly higher mortality rate. (RR [95 % CI]; 5.01 [1.55 – 16.2]) However, the mortality rates of COVID-19 in cancer patients were lower than those in patients without cancer in age groups older than 50 years, though they were not statistically significant. (Table 1)

Cytokine-associated lung injury is a potential etiology in severe cases of COVID-19. [3] Patients with

cancer have impaired immune systems, which may decrease the frequency of overwhelming lung inflammation, contributing to these patients' non-inferior mortality rates. [4,5] Nevertheless, in young populations, whose mortality rate from COVID-19 is very low in general, baseline fragility in cancer patients may lead to a relatively higher rate of deaths.

The unclear causation between COVID-19 and intubation or death is a limitation in this aggregate-level data analysis. Additionally, the heterogeneity of cancer types and varying stages of the disease may obscure the rationale of our findings. However, this is the first report on the prognosis of COVID-19 patients with cancer in the US. The relatively large number of patients in the study allowed for the adjustment of age, which is one of the strongest prognostic factors. Further study based on the individual patients' data is warranted for a better understanding of the risk of COVID-19 in cancer patients.

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Author Contributions: HM had full access to all the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Study concept and design: HM, TY

Acquisition, analysis, or interpretation of data: HM

Drafting of the manuscript: HM

Critical revision of the manuscript for important intellectual content: TM, TY, NC, CC

Statistical analysis: HM, TM

Administrative, technical, or material support: HM

Study supervision: CC, SC, DR

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Reference

1 Zhang L, Zhu F, Xie L, *et al.* Clinical characteristics of COVID-19-infected cancer patients: A retrospective case study in three hospitals within Wuhan, China. *Ann Oncol* 2020; published online March. DOI:10.1016/j.annonc.2020.03.296.

2 Oh WK. COVID-19 Infection in Cancer Patients: Early Observations and Unanswered Questions. *Ann Oncol* 2020; published online March 31. DOI:10.1016/j.annonc.2020.03.297.

3 Xu Z, Shi L, Wang Y, *et al.* Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir Med* 2020; published online Feb 18. DOI:10.1016/S2213-2600(20)30076-X.

4 Xia Y, Jin R, Zhao J, Li W, Shen H. Risk of COVID-19 for patients with cancer. 2020. DOI:10.1016/S1470-2045(20)30096-6.

5 Schreiber RD, Old LJ, Smyth MJ. Cancer immunoediting: Integrating immunity's roles in cancer suppression and promotion. Science (80-.). 2011; **331**: 1565–70.

Table 1. Relative risk of intubation or death in patients with or without cancer stratified by age groups

	Intubation (event / total)			Death (event / total)		
Age	With cancer	Without cancer	Relative risk (95 % CI)	With cancer	Without cancer	Relative risk (95 % CI)
All	37 / 334	314 / 5,354	***1.89 (1.37 – 2.61)***	37 / 334	518 / 5,354	1.15 (0.84 – 1.57)
≤ 50	2 / 53	52 / 2,035	1.48 (0.37 – 5.90)	3 / 53	23 / 2,035	***5.01 (1.55 – 16.2)***
51 - 65	8 / 84	113 / 1,557	1.31 (0.66 – 2.60)	4 / 84	117 / 1,557	0.63 (0.24 – 1.68)
66 - 80	22 / 143	104 / 1,191	***1.76 (1.15 – 2.70)***	15 / 143	173 / 1,191	0.72 (0.44 – 1.19)
≥ 81	5 / 54	45 / 571	1.17 (0.49 – 2.83)	15 / 54	168 / 571	0.94 (0.60 – 1.48)